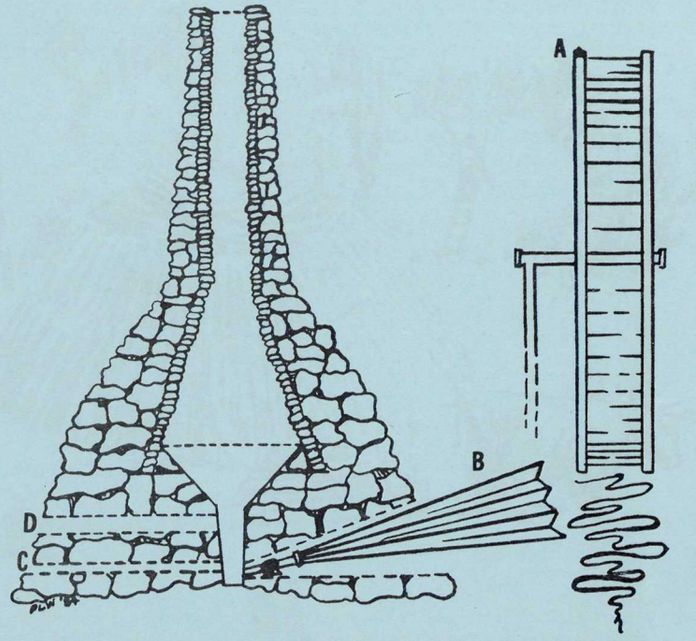


Cutaway drawing of the Iron Furnace at Cumberland Gap. Drawing by Polly Lee Wilder. (A) The overshot water wheel powered the bellows. (B) The bellows pumped huge volumes of air during the blast process. (C) The molten iron was run off through this channel into the casting shed. (D) This channel was used to drain off the slag.

## SMELTING

When the charcoal, limestone, and iron ore were assembled, the blast had to be set in the furnace. A bridge from the hill in back of the furnace allowed "fillers", often slaves, to carry the charcoal, ore, and limestone to the top of the furnace and drop it in. The recipe for one ton of iron from the Cumberland Gap furnace was 200 bushels of charcoal, two tons of ore, and 500 pounds of limestone.

When the furnace was filled, the charcoal at the bottom was lit; large amounts of air were blown by bellows through the tapered bottom of the furnace. The intense heat caused the limestone to combine with the iron ore's impurities. The whole mixture settled to the bottom with the impurities, or slag, floating to the surface of the molten iron. The slag was skimmed off, allowed to cool, and dumped as a by-product. A slag pile is still visible in front of the furnace.

## CASTING

The furnace master would have to determine just the right moment to "tap", which means to pull the plug.

The pure molten iron was run off in a channel into the casting shed which was a wooden building standing between the slag pile and the furnace. The shed had a sand floor used for casting.

The main channel had several branches that ran off to either side. It was said that the main channel resembled a sow lying with her piglets, so the main channel was called the "sow" and the side channels were called "pigs"; hence the term pig iron. The pigs were broken off when cool and stacked. The furnace at Cumberland Gap produced about 43 pigs daily weighing 150 pounds each.

The damp sand floor could also be molded so that objects such as dutch ovens, skillets and plows could be cast from the molten iron. The large overshot water wheel supplied power to the bellows, as well as a 500-pound hammer mill which beat objects into desired shapes. Pig iron was carried to the Powell River and shipped to Chattanooga, or sold directly to blacksmiths for their use.

## THE AGE OF STEEL

Most historians consider the Bessemer Process of blasting cold air through the furnace to convert iron into steel to be the most important development in the latter part of the industrial revolution. Sir Henry Bessemer of England has been credited with this great discovery. In fact it was William Kelly working at a small furnace in Kentucky who was the first to develop this process. Although Kelly was finally given credit legally for his work, he died in poverty and without his name becoming linked with one of the greatest inventions of the 19th century.

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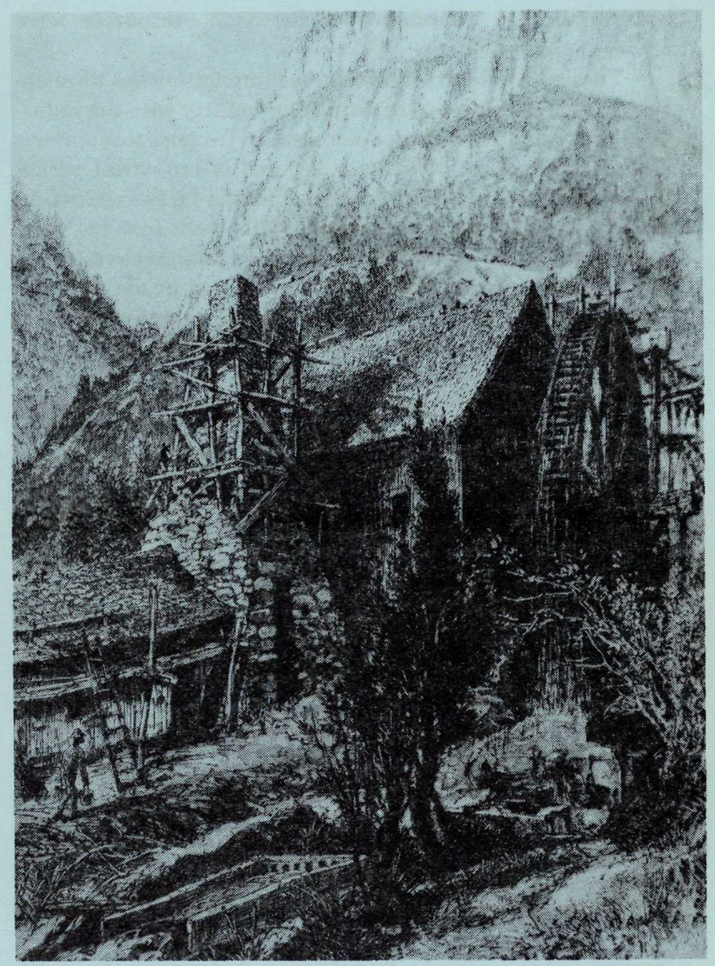
# THE IRON INDUSTRY AT CUMBERLAND GAP



The iron furnace as sketched by Harry Fenn in 1870.

Imagine the tools one would need to survive 150 years ago as a new nation was being created from the frontier wilderness. The American long rifle, the broad axe, the oxen shoes, the cast iron cooking pot as well as luxury items are examples of pioneer essentials that establish a need for the iron furnace. In order for this need to be met there had to be a gathering of natural resources (iron ore, limestone, and hard wood to make charcoal) along with labor to build and maintain the furnace. Thus, throughout the 1800's, furnaces such as the one you see before you dotted the countryside where an abundance of necessary resources were located.

The iron industry had a great impact on the development of the Nation by thrusting the country into the industrial era. The first recorded non-Indian traveler through the Cumberland Gap unwittingly began the industrial period in this area by identifying in his diary a large creek (Gap Creek) as a "large spring which falls very fast and just above the spring is a small entrance to a large cave..... sufficient to turn a mill". He further noted in his writings that the area had an abundance of iron ore and limestone. He wrote the area was covered with large trees that would later be made into charcoal.

From the very beginning of the Cumberland Gap's recorded history, a stage was set for the establishment of the iron furnace in 1819. Although, it required a tremendous financial investment, the furnace proved to be one of the cornerstones of the frontier development. This furnace, which employed up to 300 men, provided jobs and a lifestyle to an area known as a passageway to Kentucky. Communities and homes came into being because of this iron furnace. Needs were being met each time a new supply of iron was produced. When the iron industry began to fade in 1881, this iron furnace established such a solid foundation that it allowed the new natural resource, coal, to continue to build a strong economic base.

## THE PROCESS

Making iron is a simple, but labor-intensive process. There are three basic steps in producing iron: the preparation of the iron ore, limestone, and charcoal; the smelting or converting the resources to molten iron, and the casting of the iron into desired objects.

## PREPARATION

### IRON ORE

Iron ore was hand-dug by workers, who labored 12 hours a day, six days a week. The ore was brought by wagon to the furnace, washed, broken into small pieces, and thrown on a wood fire to remove many of the ore's impurities. The ore was then stored until ready for the blast. Pits from which the iron ore was dug are still visible today near the Wilderness Road Campground.

### LIMESTONE

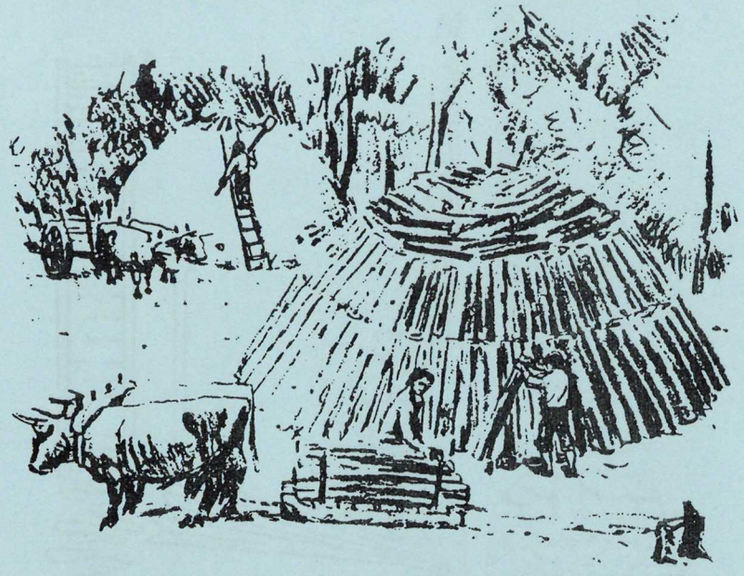
Limestone was dug by hand in nearby caves and then hauled to the furnace. When combined with the ore and heated to high temperatures, the limestone would absorb the remaining impurities from the iron ore.

### CHARCOAL

Preparation of the charcoal was the most elaborate step in making iron. Huge amounts of charcoal were needed, so the hearths, or pits, were located in forested areas. Fifty cords of wood were required for each burning. Wood choppers were paid 40 cents per cord and could usually cut two to two-and-a-half cords of wood per day using only an ax.

The amount of charcoal produced from the "pit" varied with the skill of the workers and the quality of the wood, hardwoods providing the best (hottest) fires. The iron furnace operated on approximately 625 bushels of charcoal a day, and so required as much as 5,000 cords of wood a year. As a result, within 40 years Pinnacle Mountain had been completely stripped of trees.

The charcoal pit was circular and about 30 feet in diameter. In the center was a small chimney called a crow's nest which was filled with dry wood. Green cord wood, which would become charcoal, was neatly stacked 15-20 feet high around the crow's nest. Four foot-long logs were stacked three high to enclose a pit. The pit was then covered with wet leaves, six inches on the sides and eight inches on the top, followed by clay of the same thickness. The pit was then ready for firing.



Green cord wood was stacked around the crow's nest to form a charcoal pit. Drawn by Joshua Tolford for **Pioneer Iron Works** by Mary Stetson Clarke.

The "collier" (the man in charge of the operation) would climb to the top of the pit and light the dry wood in the crow's nest. This in turn lit the green wood. To insure slow, precise burning, holes allowing air into the pit were carefully watched and regulated by the collier. This was so important, for if the fire became too hot, or if any flames became visible, the entire operation would be a failure. During the burning season, the collier was on duty around the clock, living in a lean-to by the pit, and as a result was constantly covered with soot.

After a week or two of slow burning, the charcoal was ready; this could be determined by the color of the smoke. It was doused with water to prevent further burning. It was then carted to the iron furnace for use in the manufacture of iron.

Despite the abundance of coal in the region, it was never used in this furnace in the iron-making process. Because iron makers in England had switched over to coal nearly 100 years before iron makers in this country, there is still speculation among historians why America did not use one of its most abundant resources in iron making.